river bank of the Rio del Rey to its source, then striking direct to the left river bank of the Old Calabar or Cross river, and terminating after crossing that river at the Rapids in about 9° 8′ E. long. Germany has agreed not to interfere to the west of the above line. Both powers relinquish any existing protectorates within the limits of the territories assigned to each, except that Victoria, Ambas bay, will still continue a British colony. Germany also engages to refrain from making acquisitions of territory or establishing protectorates on the coast between Natal and Delagoa bay.

African News.—M. de Brazza reached Paris November 12, 1885. He states that the whites and natives of the territories belonging to France are on the best of terms. Natives are being recruited to form an army.——The government of the Congo State has commissioned several geographers to execute maps of the entire State. Lieut. Massari is surveying the right bank of the Congo between the Alenia and Mobangi.——M. L. de Guiral is engaged in exploring the San Benito, about seventy miles north of the Gabon. The river is navigable only for twenty-two miles. There is a small lake eighty-seven miles from the coast, and three tributaries enter the San Benito above the first falls.

EUROPE.—*European News.*—A search for the true source of the Danube seems strange at this late date; yet M. de Wogan has found that it does not rise, as has been stated, in the gardens of the Prince of Fürstenburg, at Donaueschingen. It is formed by the union of two small streams, the Brig or Brigach and the Breg or Bregach. The first rises at Saint Georges, north of the Tryberg mountain and about a mile from the source of the Neckar, while the second rises at St. Martin, west of Tryberg and twenty miles from Donaueschingen, where the two streams unite.——The range called Umb-dek, in the Kolu peninsula, about a thousand meters high, is the highest land in European Russia north of the Caucasus.——Bosnia and Herzegovina have increased fifteen per cent in population between 1879 and 1885. The population at the latter date was 1,336,101.

GEOLOGY AND PALÆONTOLOGY.

THE VERTEBRATE FAUNA OF THE TICHOLEPTUS BEDS.—In the Report of the U. S. Geological Survey of the Terrs., Vol. III, p. 18 (1885), I have given some of the characters of this horizon and its fauna. It is intermediate in all respects between the Middle and Upper Miocene formations of the West, as represented by the John Day and Loup Fork beds. It was first explored in the valley of Deep river, Montana, by my assistant, J. C. Isaac, and afterwards by J. L. Wortman on the Cottonwood creek, Oregon. At the latter locality it is seen to rest on the John Day beds, as stated by Mr. Wortman, and as indicated by the collec-

tions made by him. The following species were found at the latter locality:

Protohippus, ? sp.
Hippotherium seversum Cope.
" *sinclairi* Wortman.
" *occidentale* Leidy.
Anchitherium ultimum Cope.
Dicotyles condoni Marsh.
Protolabis transmontanus Cope.
Merycochœrus obliquidens Cope.
Blastomeryx borealis Cope.

Considerable interest attaches to the discovery of an Anchitherium and of a Merycochœrus at this locality, as these genera ally the epoch to the John Day period, while Hippotherium, Dicotyles and Protolabis are Loup Fork genera.

The *Anchitherium ultimum* is represented in my collection by a nearly complete superior dentition, with palate and sides of skull to the middle of the orbits, and top of skull to above the infraorbital foramen. The size is less than that of the *A. præstans* Cope and *A. equiceps* Cope (*? A. anceps* Marsh) of the John Day bed, and the dental series has the same length as that of the *A. longicriste* Cope, also of the John Day.

It is in the cranial characters that this species displays the greatest differences from the John Day species. In the first place there is a profound and large preorbital fossa, separated from the orbit by a vertical bar. The preorbital fossa in the John Day species is shallow, and not abruptly defined. In the next place the anterior border of the orbit is above the anterior border of the last molar tooth. In this it agrees only with the large *A. præstans;* in the *A. equiceps* and *A. longicriste* the anterior border of the orbit is above the anterior part of the second superior molar. Thirdly, the infraorbital foramen is above the middle of the fourth premolar; it is over the posterior part of the third in the three John Day species. Finally, the nareal notch marks the anterior two-fifths of the diastema; it extends much further back in the John Day species, marking either the front or middle of the first premolar. The palate extends about as far anteriorly as in *A. præstans*, viz., to opposite the posterior border of the first true premolar.

The *Merycochœrus obliquidens* is smaller than any known species of Merycochœrus, about equaling the larger individuals of *Oreodon culbertsoni.* The molar teeth are, however, relatively larger than in that animal, and in the species of Eucrotaphus, and the anterior premolars and incisors smaller and more crowded. The last two premolars are in line, but the second premolar is set obliquely in the jaw so as to overlap the first premolar by the whole of its anterior root, and the third premolar by half of its posterior root. The anterior root is interior, the posterior exterior. The first premolar has a robust root with round section. The crown is but little expanded at the posterior base; anterior part and apex lost. The alveolus of the canine diverges some-

what outward. The symphyseal suture is short and rather deep. Its posterior edge is below the posterior quarter of the third premolar.

In the *Merychyus pariogonus* Cope of the Deep River Ticholeptus bed, the posterior part of the ramus is more expanded, and is perfectly rounded, while the other dimensions are considerably smaller.

Full descriptions of these species are given in a paper read before the American Philosophical Society, Feb. 19, 1886.

The species of the Ticholeptus beds of Montana are the following:

Mastodon proavus Cope.
Protohippus sejunctus Cope.
Merycochœrus montanus Cope.
Merychyus zygomaticus Cope.
" *pariogonus* Cope.
Cyclopidius simus Cope.
Cyclopidius emydinus Cope.
Pithecistes brevifacies[1] Cope.
" *decedens* Cope.
" *heterodon* Cope.
Procamelus vel Protolabis, sp.
Blastomeryx borealis Cope.

The only species common to the two lists is the *Blastomeryx borealis*, a fact which indicates some important difference in the horizons, either topographical or epochal. The Oregon specimens consist of teeth only, from both jaws, which are identical with those of the three crania known from Deep river. This animal is one of the deer-antelope, with persistent horns and deer-like dentition. Its horns are long and stout, and have a wide basal expansion above the posterior part of each orbit. It is about as large as the black-tailed deer.

The Ticholeptus horizon is interesting as that in which the genus Mastodon makes its first appearance in America. It is now shown to be the last which contains the genus Anchitherium.—*E. D. Cope.*

SCUDDER'S FOSSIL INSECTS.—Mr. S. H. Scudder has contributed to Zittel's Handbuch der Palæontologie, now being issued in parts at Munich and Leipzig, a very valuable résumé of our knowledge of fossil tracheate Arthropoda, with abundant and excellent illustrations in the text. In accordance with the treatment in other parts of the work, the classes are first defined, also the orders and families, while the genera are less briefly diagnosed and the leading species mentioned, or where the species are numerous the number of known fossil ones given. In the myriopods American forms predominate, while among the Arachnida more European species are known. The tables of geologi-

[1] The absence of caries in the teeth of extinct Mammalia is well known. The type specimen of the *Pithecistes brevifacies*, however, displays a carious excavation on the external side of one of its inferior molars. This feature adds to those which indicate the degeneracy and approaching extinction of this type, as I have remarked in my synopsis of the Oreodontidæ, Proceedings American Philosophical Society, 1884, 557.

cal distribution of both myriopods, Arachnida and insects are of much value.

The class of insects begin with the Palæodictyoptera, which embrace all the Palæozoic insects, and is regarded as equal in rank with the Heterometabola (Orthoptera, Neuroptera, Hemiptera and Coleoptera).

The principal forms are well illustrated. As a provisional arrangement the Palæodictyoptera, as thus limited, may serve a temporary purpose, but the wonderful discoveries of Brongniart at Commentry, in France, seems to us to forbid the adoption of such a division, and to favor Brongniart's view that many of them, except Eugereon and possibly others, are simply Palæozoic genera of existing orders of insects, *i. e.*, representatives of distinct and extinct families, rather than of lost orders. But Brongniart's discoveries were not placed in the hands of the scientific public until after the work before us was mostly in print. Some of the divisions, as the Coleopteroidea, for the unknown manufacturer of the holes attributed to Hylesinus by Brongniart, seems unnecessary. Why the Thysanura should be placed as a "family" of the suborder Pseudoneuroptera is inexplicable to us, now that their structure is so well known.

But however one may differ from the author in matters of classification, he can not fail to note the care, labor and learning which has been bestowed upon this excellent and most useful summary.

Oscar Schmidt on the Origin of the Domestic Dog.[1]—We must now refer to the question of the origin of the domestic dog. That the whole line of foxes has nothing to do with the dog has long been an established fact. On the other hand Darwin endeavored to prove that various wild tribes of men in different parts of the globe tamed native wolf-like animals, and that the crossings of these species and breeding of various kinds produced the domestic dog of our day. This opinion of Darwin has been somewhat modified by L. H. Jeitteles, a careful authority on the domestic animals. According to him the wolf (*Canis lupus*) has no connection with the European and west-oriental races of dogs, the connection being mainly through the *jackal* and the *Indian wolf (Canis pallipes)*. The races partly lead back into prehistoric times. Closest to the jackals we have the so-called *turf-dog*, known from the turf deposits of the lake-dwellings, and which is probably the ancestor of our Pomeranian dogs. Allied to it we have the terriers and turnspits. From *Canis pallipes* is descended the so-called *bronze-dog*, which most probably came to Europe with human immigrants from Asia, and with it the sheep dog of Central Europe, the larger sporting dog, the poodle, cur-dog and bull-dog. The ancestor of a third group may perhaps be found in the large jackal (*Canis lupaster*) of North Africa, to which we

[1] The Mammalia in their relation to primeval times. New York, D. Appleton & Co., 1886.

should also have to refer the ancient *Egyptian-dog*, the Oriental *street-dog* and the *wild dog of Africa*.

This does not as yet settle the question as to which fossil forms may be concealed among the numerous races of the domestic dog. Various conjectures have been made, none of which, however, are based upon any special reasons. According to Blainville's opinion, a diluvial species of a gentle and sociable nature—no longer existing in a wild state—must have been the primeval form of the domestic dog; but after what has been said above, this general way of settling the question must be regarded as one that no longer holds good. Woldrich's views show a greater amount of probability, and have lately been taken up again; he maintains that our domestic races are descended from several wild forms of the Canidæ of the Diluvium, and herein he agrees with what Darwin and Huxley have stated regarding the relation between the domestic dog and the living jackals and wolves.

It may with certainty be maintained that the direct ancestors of the European wolf are to be found in the Diluvial deposits. Formerly a huge animal of the wolf species was distinguished as the *cave-wolf*, without there being any distinct character to separate the two forms. A third form of wolf (*Canis suessii*, from the löss near Vienna) is described as a slim but powerful animal, strong enough even to pursue and overpower the larger species of plant-eaters. It is, in fact, one of the eight species of wolves which can be distinguished during the Diluvial early ages of man. And in addition to these there are about five kinds of foxes.

In now returning to the living Canidæ, several species demand our attention, one of which is described as *Icticyon venaticus*, a native of Brazil, the other under the generic name Cyon, inhabiting the countries to the north and north-east of the Altain mountains. These dogs do not possess the third molar in the lower jaw, and the molar tooth in the upper jaw is so small that a reduction appears to be imminent there as well. It is in the natural course of things that one or both of the first premolars, or the last molar, should become useless and forced to disappear by the neighboring teeth being specially taken into requisition, although in most cases we do not know the immediate reason of this.[1] The other circumstances of the structure of this group do not lead us to expect anything special from this concentration of the dentition. In former times, however, as we shall soon see, a most varied de-

[1] Any of our readers who can examine the head of a dachshund may convince themselves of the fact that the first premolar above and below can scarcely be of any use to the animal; it is a little stump which does not come in contact with the opposite row of teeth, and is frequently wanting altogether. If the dachshund is not forcibly suppressed as a species, its dentition will one day inevitably be reduced by one premolar.

velopment of new genera of beasts of prey began with dog-like animals.

Much more interesting for the purpose of our investigation here is the *Otocyon lalandii*, the spoon-dog of South Africa, so called from the peculiar formation of the skull. Its habits show an approximation to the foxes, yet as regards dentition it does not show this affinity, inasmuch as it possesses $\frac{4}{4} : \frac{4}{4}$ molars, and also shows the most remarkable differences in the relative size of the single teeth. As already said, the spoon-dog is, in many ways and as regards dentition, shaped after the fashion of the dog type, and can thus scarcely be dragged out of this connection, and we are compelled to look upon it as a still existing primary form of dog. The whole palæontology of the vertebrates shows that the many-toothedness of mammals is an inheritance from their lower ancestors, and that any increase of the teeth within a class has probably never taken place.

As our dogs, with their $\frac{2}{3} : \frac{2}{3}$ molars, have no doubt been descended from fuller-toothed animals, Otocyon must be regarded as the still-living representative of the early type of dog, which in other characteristics shows more affinity to the fox genus. But as there also exist species of the group *Canis azaræ* with very small frontal depressions, it is, as Huxley says, very difficult not to imagine that these too must be traced to ancestors of the Otocyon type. From this species, therefore, we should have to derive the two lines which diverge into the fox on the one hand, and the wolf on the other. We are supported in this view by the observation that the South American *Canis cancrivorus* often possesses the fourth molar, and thus shows itself to be another remnant of the primary form. A fourth supernumerary molar of this kind is not a monstrosity or pathological phenomenon, but an atavism or reversion of the same sort as the so-called wolf's tooth in horses, which was explained as a premolar which existed in the primary genus Anchitherium.

Hence the key to the derivation of all the dog tribe is to be found in their relation to the spoon-dog.

GEOLOGICAL NEWS.—*Silurian.*—S. G. Williams, in a communication to the February number of the *American Journal of Science*, states that rocks of the Lower Helderberg period, including all above the water-lime group, are represented in New York, as far west as Cayuga lake, by limestones not less than sixty-five feet thick, containing an unmistakable Lower Helderberg fauna. Though fossils are rare in Cayuga county, fifteen species have been found, two or three of which are as yet undescribed, while the others all belong to Lower Helderberg species. Among them are two species of Strophodonta, *Rhynchonella semiplicata*, Stromatopora (most abundant of all), a Favosites and a Zaphrentis.

Triassic.—The geological age of the yellow sandstones lying north of the city of Elgin (Scotland) has been much debated, stratigraphists having maintained that they belonged to the Devonian (or rather Old Red sandstone), while palæontological evidence is in favor of their Triassic age. The Lacertilia are represented by Telerpeton, Hyperodapedon and an undescribed form, Crocodilia by Stagonolepis, and Dicynodontia by the type genus. Dr. Judd and Dr. Gordon have now procured good evidence that this reptiliferous sandstone passes down into a bed of conglomerate which rests unconformably upon the strata of the Upper Old Red sandstone. The conclusion is that during the vast periods of the Carboniferous and Permian, the Upper Old Red sandstone of the Elgin area was upheaved and denuded, and the Upper Trias beds deposited unconformably upon their eroded surface.

Jurassic and Cretaceous.—MM. Bertrand and Kilian, who have studied the Jurassic and Cretaceous strata of Andalusia, report that their composition is very like that of the same beds in the Alps. There are also many analogies between them and the corresponding beds of Sicily and of the Apennines, while the upper beds resemble those met with in the Balearic islands. The brachiopod beds of the Middle Lias and the ammonite beds of the Toarciari are met with alike in Sicily, the Apennines and parts of the Alps.

Quaternary and Recent.—M. Choper reports the existence of glacial beds in the French colony of Assinie, upon the coast of Guinea.——A letter from J. W. Dawson to *Nature* contains some interesting notes upon the causes of the purity of Nile mud. This mud, brought down chiefly by the Atbara and the Blue Nile from a country of siliceous and crystalline rocks, is, like that of the St. Lawrence, almost free from salt. It is also deficient in kaolin, (1) because the current of the river is sufficiently strong to wash into the sea all the more finely comminuted argillaceous matter; (2) because the older gneisses and schists do not kaolinize like Cornish granites, but crumble into sand, much of the feldspar remaining in a perfect state.——Professor Heim, known as one of the best authorities on glaciers, states that the motion of a glacier is, to a preponderating extent, the result of gravity. He enumerates partial internal liquefaction, caused by pressure; plasticity of the ice as it approaches the melting-point; ruptures and slight displacements, alternating with partial regelation and sliding on its bed, as sources of glacier motion. Glaciers merely smooth and very slightly wear away the previously existing rough surfaces, while streams and sub-aërial weathering have given valleys their form. The glacier is more of a carrier and rubbish-remover than of a delver and ploughman.